

## ABSTRACT

An *in vivo* optical imaging system and method of identifying unusual vasculature associated with the angiogenic vasculature in tumors. An imaging system acquires images through the breast. Benign, noninvasive oxygen and carbon dioxide are used as vasoactive agents and administered by inhalation to stimulate vascular changes. Images taken before and during inhalation are subtracted. An optical vascular functional imaging system monitors abnormal vasculature through optical measurements on oxy- and deoxy-hemoglobin during inhalation of varying levels of O<sub>2</sub> and CO<sub>2</sub>. The increase in contrast between tumor (cancerous) and normal (noncancerous) tissue is dramatic, facilitating accurate early detection of cancerous tumors and improving sensitivity and specificity (lower false negative and false positive rates). The invention is useful in mammography, dermatology, prostate imaging and other optically accessible areas.